

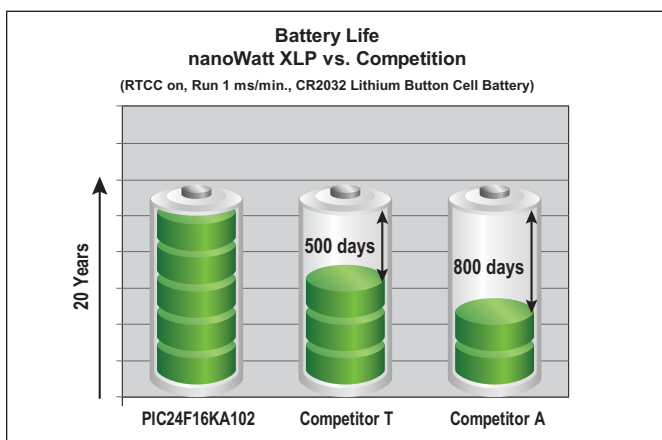
# nanoWatt XLP eXtreme Low Power PIC® MCUs

## Looking Beyond Low Power MCUs

As more electronic applications require low power or battery power, energy conservation becomes paramount. Today's applications must consume little power, and in extreme cases, last for up to 15-20 years, while running from a single battery. To enable applications like these, products with Microchip's nanoWatt XLP Technology offer the industry's lowest currents for Run and Sleep, where extreme low power applications spend 90%-99% of their time.

Benefits of nanoWatt XLP Technology:

- Sleep currents below 20 nA
- Brown-out Reset down to 45 nA
- Watch-dog Timer down to 220 nA
- Real-time Clock/Calendar down to 470 nA
- Run currents down to 35  $\mu$ A/MHz
- Full analog and self-write capability down to 1.8V



## Example Applications

### Battery

- Utility Metering
- Asset Tracking
- Electronic Locks
- Portable Medical
- Smoke/CO<sub>2</sub> Detectors
- Irrigation Systems
- Security Systems/Sensors
- Remote Keyless Entry
- Consumer

### Green Initiatives

- Compliance with Regulations
- Appliances
- Home Electronics

### Energy Harvesting

- Wireless Switches
- Battery-free Sensors
- Wireless Sensor Networks
- RF Powered Sensors

## Low Power Peripheral Integration

Many of today's low power products need advanced peripherals. Microchip offers low power devices with peripherals like USB, LCD, RTCC and mTouch™ capacitive sensing. This eliminates the need for additional parts in the application, saving cost, current and complexity.

## Low Power Safety

Products with nanoWatt XLP have system supervisory circuits specially designed for battery powered products.

- The Low Power Brown-out Reset protects applications when batteries are depleted or changed, yet consumes a tiny 45 nA of current
- The Real-time Clock Calendar is a fully independent module that is unaffected by device resets
- Using a dedicated on-chip oscillator, the WDT provides protection against system failure for around 300 nA with programmable time-outs lasting up to 25 days

## XLP Battery Life Estimator (Free Download)

The XLP Battery Life Estimator is free PC software to aid in developing eXtreme Low Power applications with Microchip's PIC MCUs featuring XLP technology. The utility allows users to select the target MCU and battery type, as well as input the current generated by the rest of the application. It models the active current, sleep current, and the time spent in each mode to provide an estimate of battery life.

- Easy to Use
  - Select your PIC MCU with XLP Technology
  - Select your battery type
  - Enter application Run and Sleep times
  - Select peripherals and input application currents
  - View battery life, average and maximum current estimates
- Flexible
  - Customizable to allow new device profiles and battery specifications to be added
  - Save profiles and compare results

Visit the XLP design center at [www.microchip.com/XLP](http://www.microchip.com/XLP) for: a complete list of XLP MCUs and datasheets, XLP development tools, low power app notes, case studies, tips & tricks and webinars, and videos showing XLP performance.








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## nanoWatt XLP MCU Portfolio

With many pin, memory and peripheral combinations available, Microchip's nanoWatt XLP products have the right combination of features for your low power application.

### Example XLP PIC® MCUs

Device		Flash Memory (KB)	Pins	Sleep (nA)	WDT* (nA)	RTC* (nA)	1 MHz Run (µA)
PIC16LF18XX	CAP SENSE	3.5-7	8-20	20	300	600	35
PIC16F15XX	CAP SENSE	14	28	20	300	600	39
PIC16LF193X	CAP SENSE 	7-28	28/44	60	500	600	150
PIC18LF1XK50	CAP SENSE 	8-16	20	24	450	790	170
PIC18LF14K22	CAP SENSE	8-16	20	34	460	650	150
PIC18LF4XK22	CAP SENSE	8-64	28/44	50	600	500	250
PIC18F46J11	CAP SENSE	16-64	28/44	13	813	813	272
PIC18F46J50	CAP SENSE 	16-64	28/44	13	813	813	272
PIC18F87K90	CAP SENSE 	32-128	64/80	25	350	720	181
PIC24F04KA201	CAP SENSE	4	14/20	20	370	470	195
PIC24F16KA102	CAP SENSE	8-16	20/28	20	420	520	195
PIC24F32KA304	CAP SENSE	16-32	20/28/44	20	400	500	205
PIC24FJ64GB004	CAP SENSE 	32-64	28/44	20	220	520	250

\*Base sleep current included in WDT and/or RTC numbers. Typical I/O pin leakage current  $\pm 5$  nA. All numbers are typical values at minimum V<sub>DD</sub>, taken from the data sheet.



### XLP 8-bit Development Board (DM240313)

Get started with 8-bit low-power design. This board enables development with the 8-bit family of PIC XLP MCUs.

- Supports PIC16 and PIC18 devices
- Flexible power options
  - CR2032 coin cell
  - 2x AAA lithium\* or alkaline cells
  - Energy harvesting
  - USB, external or 9V supply
- Enhanced prototyping:
  - LCD display
  - PICTail™ connector
  - LEDs, resistive pot, temperature sensor and EEPROM



### XLP 16-bit Development Board (DM240311)

Designed with eXtreme Low Power in mind, this board enables development with the PIC24F family of 16-bit PIC XLP MCUs.

- Supports 20-/28-pin devices
- Flexible power options
  - CR2032 coin cell
  - 2x AAA lithium\* or alkaline cells
  - Energy harvesting: solar, vibration, RF, etc.
  - External/USB
- Easy Prototyping:
  - PICTail connector supports RF Modules, SD/MMC storage, speech playback modules and more
  - LEDs, capacitive and mechanical buttons, resistive pot, temperature sensor and EEPROM
  - Generic prototyping area
  - USB communication to PC

\* Microchip recommends Energizer® Ultimate Lithium AAA Batteries for the XLP 16-bit Development Board.



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